WHAT IS CLAIMED IS:

1. A low core loss magnetic alloy with a high saturation magnetic flux density, which has a composition represented by the general formula:

$$(Fe_{1-a}\ Co_a)_{100-y-c}\ M'_y\ X'_c \text{(atomic \%)}$$

where M' represents at least one element selected from V, Ti, Zr, Nb, Mo, Hf, Ta, and W,

X' represents Si and B, an Si content (atomic %) is smaller than a B content (atomic %), the B content is from 4 to 12 atomic %, and the Si content is from 0.01 to 5 atomic %,

a, y, and c satisfy respectively $0.2 < a < 0.6$, $6.5 \leq y \leq 15$, $2 \leq c \leq 15$, and $7 \leq (y + c) \leq 20$,

at least a part of an alloy structure being occupied by crystal grains having grain size of not larger than 50 nm,

a saturation magnetic flux density B_s being not less than 1.65T, and

a core loss P_{cm} per unit volume in conditions at 80°C, f = 20 kHz, and B_m= 0.2T being not more than 15 W/kg.

2. A low core loss magnetic alloy with a high saturation magnetic flux density, which has a composition represented by the general formula:

$$(Fe_{1-a}\ Co_a)_{100-y-c}\ M'_y\ X'_c \text{(atomic \%)}$$

where not more than 5 atomic % in total of Fe and Co are substituted by at least one element selected from Cu and Au,

M' represents at least one element selected from V, Ti, Zr, Nb, Mo, Hf, Ta, and W,

X' represents Si and B, an Si content (atomic %) is smaller than B content (atomic %), the B content is from 4 to 12 atomic %, and the Si content is from 0.01 to 5 atomic %,

a, y, and c satisfy respectively $0.2 < a < 0.6$, $6.5 \leq y \leq 15$, $2 \leq c \leq 15$, and $7 \leq (y + c) \leq 20$,

at least a part of alloy structure being occupied by crystal grains having grain size of not larger tha 50 nm,

a saturation magnetic flux density B_s being not less than 1.65T, and

a core loss P_{cm} per unit volume in conditions at 80°C, f = 20 kHz, and B_m= 0.2T being not more than 15 W/kg.

3. A low core loss magnetic alloy with a high saturation magnetic flux density as set forth in claim 1 or 2, wherein (a) satisfies $0.3 \leq a \leq 0.55$.

4. A low core loss magnetic alloy with a high saturation magnetic flux density as set forth in claim 1 or 2, wherein a part of M' are substituted by at least one element selected from Ni, Cr, Mn, Sn, Zn, In, Ag, Sc, platinum group elements, Mg, Ca, Sr, Y, rare

earth elements, N, O, and S.

5. A low core loss magnetic alloy with a high saturation magnetic flux density as set forth in claim 1 or 2, wherein a part of X' are substituted by at least one element selected from C, Ge, Ga, Al, and P.

6. A low core loss magnetic alloy with a high saturation magnetic flux density as set forth in claim 1 or 2, wherein the alloys are subjected to a heat treatment in a magnetic field, and a squareness ratio $B_r B_s^{-1}$ being not more than 10%.

7. A low core loss magnetic alloy with a high saturation magnetic flux density as set forth in claim 1 or 2, wherein a part of an alloy structure comprises amorphous phases.

8. A low core loss magnetic alloy with a high saturation magnetic flux density as set forth in claim 1 or 2, wherein at least a part of crystal grains having grain size of not larger than 50 nm has a body centered cubic structure.

9. A low core loss magnetic alloy with a high saturation magnetic flux density as set forth in claim 1 or 2, wherein ordered lattices exist in an alloy structure.

10. Magnetic parts being constituted by the low core loss magnetic alloy with the high saturation magnetic flux density as set forth in claim 1 or 2.